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ABSTRACT

Landmark studies in the late 1970s and 1980s, including Tennessee's Project STAR (Student Teacher Achievement Ratio), raised the nation's awareness that reduced class size does have a positive impact on students' academic achievement. This report provides a sketch of class-size reduction's history in a prefatory overview. Chapter 1 describes Tennessee's Project STAR, including the program's planning and implementation stages, and results. Chapter 2 describes state-level class-size reduction (CSR) initiatives, including Wisconsin's Student Achievement Guarantee in Education (SAGE) program, California's CSR program, and the U.S. Department of Education's CSR program. In chapter 3, recent CSR initiatives in the SERVE (Southeastern Regional Vision for Education) region--Alabama, Florida, Georgia, Mississippi, and South Carolina--are described. Chapter 4 lays out SERVE's CSR research at the state, district, and school levels. Chapter 5 presents conclusions of SERVE's research, and provides recommendations in planning, implementing, and designing CSR programs. Future research should include investigating how highly effective teachers maximize the achievement benefit of CSR, how to conduct creative CSR funding, and how successful CSR strategies can be implemented. An appendix lists website resources on CSR. The report concludes with a description of SERVE. (Contains 59 references.) (RT)

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How Class Size Makes a Difference

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Authors' Note

Class-size reduction (CSR) is one strategy researchers have found that increases student achievement and, in many cases, reduces the achievement gap. This publication summarizes findings from several major state-level CSR initiatives, including Tennessee's Project STAR, Wisconsin's SAGE program, and California's CSR initiative. It also provides an overview of the U.S. Department of Education's CSR program and examines CSR implementation and results over time in two North Carolina districts. The publication includes conclusions and recommendations for CSR implementation, project design, classroom instruction, professional development, and research and evaluation. It offers information for a variety of audiences, including policymakers, parents, and state-, district-, and school-level educators.

The authors wish to provide information about terms associated with CSR, its overall impact, and the evaluation of CSR initiatives at the district and school level. It is important to preface any discussion about class size by making a distinction between two terms which seem synonymous but are, in fact, quite different. These terms are *pupil-teacher ratio* and *average class size*, which is the focus of this report. A pupil-teacher ratio is calculated by dividing the number of students in a school by the number of certified personnel at that school. Certified personnel include not only regular classroom teachers but also music, art, physical education, and special education teachers. Average class size is calculated by dividing the number of students in a school by the number of regular classroom teachers. For example, a study of the Boston Public Schools (Miles, 1995) found that the pupil-teacher ratio for the district was 13:1, but the average class size was 23, thus, a more accurate representation of the typical classroom setting. Reducing the pupil-teacher ratio seldom positively impacts student achievement. CSR makes a difference in improving student achievement and is the focus of this publication.

While recent research studies and evaluations of class-size initiatives have shown that smaller classes have positive impacts on students, teachers, and schools, educators and policymakers need to keep in mind that CSR, like any other educational intervention, is not a cure-all. No single reform effort provides all the answers to the problems schools face. As well, educators and policymakers may need to make choices between effective educational practices because of financial, facility, or personnel issues.

Finally, there are hundreds of schools and districts across the country implementing CSR. Many are undertaking this with little or no evaluation or associated research effort. Both educators and researchers benefit when schools are used as natural laboratories for studying the impact of CSR. The authors urge administrators to allow their schools to participate in research efforts to help answer continuing unanswered questions about CSR.

Overview

Three landmark studies, two in the late 1970s and one in the 1980s, laid the groundwork for future work in the area of class-size reduction (CSR). In 1978, Glass and Smith published a meta-analysis of reduced-class-size studies in which they considered the results to have "established clearly that reduced class size can be expected to produce increased academic achievement" (p. iv) with the major benefits being accrued when class size is reduced to below 20 students. The next year, they published a second meta-analysis examining affective measures. Although the two studies were considered controversial–due, in part, to their methodology and reliance on few studies–they had a huge impact on educational policy. The third study, Tennessee's Project STAR (Student Teacher Achievement Ratio), was initiated in 1985 and was designed as a true educational experiment. It tested three class-size treatments at 79 sites.[1] Based on this study and its corresponding positive student achievement results, states and districts began class-size initiatives in the 1990s.

SERVE's work in the area of class-size reduction began in 1994 when the organization was asked to support the evaluation efforts of a school district in western North Carolina. In 1991, Burke County Schools had originally piloted class-size reduction in first-grade classrooms in four elementary schools as a means to improve student achievement. They had eliminated the teacher assistant position in these classrooms and then reduced the number of students assigned to each teacher to 15. Pleased with the initial results, administrators expanded the program to include more first-grade classrooms in the district and reduced class size in second-grade classes at the original pilot schools. By 1994, the initiative had grown so large that the district needed assistance in revising its evaluation design and analyzing the data. SERVE staff provided assistance in these areas and began studying the initiative longitudinally.

In 1996, Rockingham County Schools, North Carolina, asked SERVE to evaluate their newly created CSR initiative at Draper Elementary School. The student achievement results at this school have also been studied by SERVE staff members over a period of time. In the Burke and Rockingham districts, staff also visited classrooms and observed teacher and student behavior and interaction. In both instances, the districts came to SERVE and requested that staff examine their class-size initiatives. SERVE staff felt that these were appropriate sites to study; they were implementing CSR as a response to low student achievement and were not affluent school systems. In fact, both served many impoverished students and their families.

How Class Size Makes a Difference is a revision of SERVE's 1996 original document on class-size reduction, *Does Class Size Make a Difference?* This document represents a compilation of current information regarding class-size reduction research at the national, state, district, and school levels, primarily focusing on CSR

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[1] STAR began with 79 sites and ended with 76.

implementation, student achievement, staff development, and teacher instructional strategies. Like all educational interventions, how CSR is implemented is critical. While reading this document, the authors ask the reader to consider:

- How class-size reduction should be implemented
- The components of a class-size reduction initiative
- The need for staff development
- The impact of class-size reduction

This is a document that will be of interest to both policymakers and educators. It is intended to provide the reader with highlights of CSR policy and research over the past 15 years and is not intended to be a comprehensive review. The initial portion, devoted to selected significant state class-size initiatives over the past 15 years, is of particular interest to policymakers at all levels. The latter part of the document, focusing on how districts and schools implemented class-size reduction and what the impact has been, appeals to district administrators and classroom teachers.

To provide a historical context for landmark CSR research, the book begins with Tennessee's Project STAR. Next, comprehensive and far-reaching class-size initiatives in the states of Wisconsin and California are reported. Although over the past 15 years other states—including Nevada, Texas, Utah, and Virginia—have initiated CSR, the California and Wisconsin efforts are included in this document because they are the most recently initiated and comprehensive. Support for class-size reduction at the federal level is described, along with class-size initiatives and legislation in the SERVE states of Alabama, Florida, Georgia, Mississippi, North Carolina, and South Carolina. Finally, SERVE's research at the state, district, and school levels is highlighted.

Chapter one

Tennessee's Project STAR

Program Planning and Implementation

In 1985, researchers in Tennessee initiated Project STAR (Student Teacher Achievement Ratio), a centerpiece of Governor Lamar Alexander's major education reform. Designed as a true educational experiment, STAR employed random assignment of more than 11,000 students and teachers at 79 Tennessee elementary schools to three different class-size conditions for pupils who entered kindergarten in 1985 (or grade 1 in 1986) and who progressed through grade 3. Students were randomly assigned to one of three class-size conditions: 1) a small (S) class of about 15 students, 2) a regular (R) class of about 25 students, or 3) a regular class with a full-time teacher aide (RA). Students maintained their class type assignment until they all returned to traditional classes in grade 4. There were over 100 classes in each of the three size conditions every year until the experiment ended at the conclusion of the 1988–1989 school year.

Student achievement was measured by the Stanford Achievement Test in grades K–3 and STAR's Basic Skills First Criterion Tests in grades 1–3. A motivation and self-concept measure was also administered each year. The original project analyzed results across the four years of the initial study. The Lasting Benefits Study began in 1989 to track the progress of the students from fifth to eighth grade, and it analyzes the long-term impact of class-size reduction. Later studies have reinterpreted the original data and also conducted new research on STAR students' advancement through high school and beyond.

Results

Researchers found that for grades K–3:

- The STAR findings consistently showed a positive small-class effect. "At each grade level (K–3), across all school locations (rural, urban, inner city, suburban), on every achievement measure (criterion-referenced and norm-referenced tests), and for all subjects (reading, mathematics, science, social science, language, study skills), the small-class students exceeded their peers in regular and regular/aide classes. The results were both statistically and educationally significant"[1] (Boyd-Zaharias & Pate-Bain, 2000).

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[1] The term "significant" in this document refers to a demonstrated relationship between a class-size reduction effort and a student outcome that is based on the strength of evidence found in a study's statistical results.

- Small classes reduced the white-minority achievement gap. While all students significantly benefited from participation in small classes, the greatest advantages were found for minority, inner-city students from low socio-economic backgrounds (Word et al., 1990). The benefit of small classes for minority students (most of whom were African-American in this study) was about twice as large as that for white students (Finn, 1998). While students were in smaller classes, the average test scores increased by 7–10 percentile points for African-American students and 3–4 percentile points for white students (Krueger & Whitmore, 2001).

- Smaller classes had the lowest percentage of students retained in grade among the three groups. For grades K–3, (S) had an average of 4.9 students retained, compared to 6.8 for (R) and 5.7 for (RA) (Word et al., 1990).

- There was no consistent positive effect of the teacher aide in the regular classes with aide (RA) condition versus the regular classes with no teacher aide (R) condition in grades K–3. That is, there were no significant differences in average test scores between students in regular size classes that had teacher aides and those that did not (Word et al., 1990; Finn & Achilles, 1990).

Studies have found that random assignment to the smaller classes in the early grades continued to have a positive impact on students throughout their later elementary and middle school years.

- STAR students who attended small classes in grades K–3 generally performed better academically than their regular-class peers in math, reading, and science in each of grades 4, 6, and 8.

  The number of years in small classes was important, though. One year in a reduced-class-size classroom in kindergarten or first grade did not produce long-term effects, even through the fourth grade. The researchers concluded that "carryover effects were consistently significant only for students who had attended small classes for three to four years. Four years in a small class put students nearly a whole school year ahead of their counterparts who had attended larger classes in K–3" (Finn, Gerber, Achilles, & Boyd-Zaharias, 2001).

- In fourth grade, students from the smaller classes were better behaved than students from the larger classes and were rated as expending more effort on class work and taking more initiative in learning activities (Finn, 1998).

Recent studies have examined the long-term impact of early assignment to small classes on student achievement in high school and beyond.

- Studies have examined the impact of STAR in terms of graduating from high school on schedule, dropping out of school, graduating with an honors diploma, and attending college (Boyd-Zaharias & Pate-Bain, 2000). They found that students assigned to the small classes in early grades:

  - Graduated on schedule at a higher rate (76%) than students from either the regular classes (64%) or the regular classes with an aide (70%).

  - Completed school with an honors diploma more often (45%) than students from either the regular classes (29%) or the regular classes with an aide (31%).

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- Dropped out of school less often (15%) compared to the regular classes (24%) and the regular classes with an aide (20%).

- Assignment to smaller classes in early grades was related to a decrease in teen pregnancy rates among some groups. Teen pregnancy rates for white females was one-third less for those assigned to smaller classes, and fatherhood rates for black teenage males was 40% less (Krueger & Whitmore, 2001).

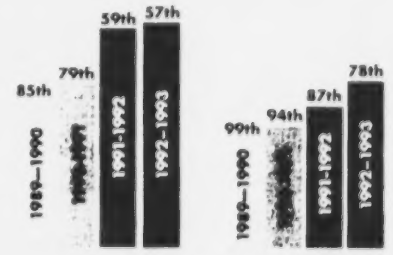
- Assignment to the smaller classes was related to an increase in the likelihood that African-American students would take the ACT or SAT college entrance exams. The increase for African-American students (from 32% to 41%) was much greater than that for white students in the smaller classes (from 45% to 46%). Krueger and Whitmore estimate that if all students were assigned to small classes for K-3, the African-American-white gap in taking a college entrance exam would decrease by more than half (Krueger & Whitmore, 2001).

Frederick Mosteller, professor emeritus of mathematical statistics at Harvard University, writes that STAR is "one of the most important educational investigations ever carried out and illustrates the kind and magnitude of research needed in the field of education to strengthen schools" (1995). STAR's impact has been far-reaching; its findings have inspired and supported the creation of numerous school-, district-, and state-level CSR efforts and the federal Class-Size Reduction Program. Researchers will continue to study the lasting impact on students of attending small classes in the early grades by looking at such things as college attendance and employment. For more information on Project STAR, see *www.heros-inc.org/star.htm*.

Tennessee's Poorest Counties

An immediate outgrowth of Project STAR was Tennessee's Project Challenge. When STAR ended, state leaders allocated STAR's remaining funds, plus state and Chapter I funds, to initiate Project Challenge, a broad-scale policy application of STAR's results in 17 (ultimately 16) of the state's poorest counties. The goal of the project was to improve the academic performance of these at-risk students by enabling teachers, through reduced class sizes of approximately 15 students, to use more effective classroom practices. In these districts, class sizes were reduced in all K-2 classrooms in 1989. As part of the project's evaluation, Achilles, Nye, Zaharias, and Fulton (1995) examined changes in the average state rank of these school systems using grade 2 results. The results are shown in Figure 1.

Figure 1
Second-Grade Average Achievement Rankings of Tennessee's Project Challenge School Districts (of 138 Districts): 1989 through 1993



In interpreting these results, consider that Tennessee had 138 systems. A ranking of 69 would be average, a ranking of 90 would be below average, and a ranking of 50 would be above average. It should be noted that in 1989-1990, pupils in grade 2 had

only one year of smaller classes. In 1990-1991, the pupils had two years in smaller classes, and beginning in 1991-1992, students had three years (K-2) in smaller classes.

The continuing movement upward in the rankings suggests that the reduction in class size is helping to increase students' scores on the state tests. In math, the 16 districts had actually exceeded the average state ranking of 69 by 1992. By 1993, these districts had moved from an average ranking of 85 to 57 in math (an average gain of 28 ranks). The gain in reading was from 99 to 78 or an average of 21 ranks. Project Challenge provided evidence that early intervention and several years of small classes are important to produce consistent and positive gains by grade 3.

Following the 1992-1993 school year, Tennessee began a statewide class-size reduction program that incrementally reduced class size in all elementary schools to an average of 20 students per class in grades K-3 (Tennessee Department of Education). Special funding for Project Challenge was ended as Tennessee transitioned to a statewide program.

Chapter two

State-Level Class-Size Reduction Initiatives

Wisconsin's SAGE program

Program Planning and Implementation

STAR provided impetus for major state-level, class-size reduction initiatives in the mid-1990s. One of these was Wisconsin's Student Achievement Guarantee in Education (SAGE) Program, begun during the 1996-1997 school year. SAGE was a five-year pilot program with a goal of improving student achievement in participating schools through four strategies: a reduction of class size to 15 students or less[1] in kindergarten through third grade, the implementation of a rigorous academic curriculum, the creation of before- and after-school activities for both students and community members, and the improvement of accountability and professional development plans. School districts with at least one school serving a student body of at least 50% low-income students were eligible to apply. Participating schools had to serve student bodies of at least 30% low-income students. In participating schools, SAGE phased in reduced class sizes for kindergarten and first grade in 1996-1997, for second grade in 1997-1998, and for third grade in 1998-1999.

State aid was provided to 30 schools from 21 districts to participate in the SAGE program from 1996-1998.[2] Based on positive early results, more funding was appropriated, and an additional 50 schools joined the program in the 1998-1999 school year. A major expansion of approximately 500 additional schools in the 2000-2001 school year was made possible by a substantial increase in state funding and a change in the requirements that made most schools eligible to participate. Currently, the state provides approximately $2,000 additional per child in a reduced-class-size classroom and offers some assistance to schools to pay debt incurred in building new classrooms to accommodate the smaller class size arrangement.

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[1] The legislative requirement of 15 students assigned to one regular classroom teacher has been met in a number of ways. The most common arrangements are: a regular classroom with one teacher and approximately 15 students (this is the most prevalent); a two-teacher team classroom where two teachers work with up to 30 students; a shared classroom space where one room is divided by a temporary wall into two classrooms of one teacher and approximately 15 students each; and a floating teacher arrangement where one teacher has up to 30 students except for math, language arts, and reading instruction when another teacher joins to team teach (Molnar, Smith, & Zahorik, 2000).

[2] Wisconsin has 1,237 public elementary schools and 426 public school districts (Wisconsin Department of Public Instruction, Wisconsin Basic School Facts).

Results

The Center for Education Research, Analysis, and Innovation at the University of Wisconsin-Milwaukee has conducted evaluations for each year of the program. Student achievement data (scores on the Comprehensive Test of Basic Skills [CTBS]) from the original 30 schools were compared to that of students from 14 schools in seven districts that serve similar populations of students. Kindergarten was not evaluated. The most recent student achievement findings for first grade come from the 1998-1999 evaluation[3]:

- CTBS post-test scores showed that SAGE students statistically outperformed their comparison school counterparts in reading, language arts, math, and total scores.
- African-American SAGE students scored lower on the pre-test in every sub-test, except reading, than African-American comparison students. Post-test results, however, showed that African-American SAGE students scored significantly higher than African-American comparison school students on every subtest and had significantly higher total scores.
- African-American students in both SAGE and comparison schools scored significantly lower on the pre-test than white students, with a larger gap in the SAGE schools. Post-test results, however, revealed that African-American SAGE students gained more than white SAGE students in terms of CTBS total scale scores, thereby reducing the achievement gap. African-American students in comparison schools achieved lesser gains, and in these schools, the achievement gap grew (Molnar et al., 1999).

The most recent student achievement findings for second grade come from the 1999-2000 evaluation[4]:

- In all areas except reading, second-grade SAGE students showed a significant achievement advantage over their comparison group counterparts.
- African-American SAGE second-graders significantly outperformed their African-American comparison school counterparts in mathematics, language arts, and total scores at the end of second grade.
- While African-American students in both SAGE and comparison schools were significantly outperformed by white students on total scale scores and on all sub-tests, the gap between African-Americans and whites was smaller in SAGE schools.

The most recent student achievement findings for third grade come from the 2000-2001 evaluation:

- The SAGE achievement advantage persists through the third grade. From the start of first grade to the end of third grade, a CSR achievement advantage is shown on all sub-tests.
- As class size rises above 15 students, the class average academic score lowers.
- No significant differences in achievement gains were observed between the 15-student/1-teacher classrooms and the 30-student/2-teacher classrooms (Molnar, Smith, Zahorik, Halback, Ehrle, Hoffman, & Cross, 2001).

For the 2000-2001 study, evaluators also conducted classroom observations and teacher inter-

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[3] The evaluation involved 143 first-grade classrooms and 2,508 first-grade students.

[4] The evaluation involved 89 second-grade classrooms and 2,624 students.

views in selected second- and third-grade SAGE classrooms and administered questionnaires to all SAGE teachers and principals. The results were consistent with their findings from earlier SAGE studies (Molnar et al., 2001):

- Teachers in reduced-size classrooms use more individualization (although direct-instruction methods are still primarily used), class discussion, and hands-on activities and achieve greater content coverage. They spend less time on discipline and exhibit greater enthusiasm.
- Higher-achieving SAGE classrooms (teachers whose classes had comparatively higher than expected achievement gain scores each of the previous two years of SAGE) exhibit a greater degree of individualization.
- Teachers in higher-achieving classrooms spend large amounts of time monitoring learning, requiring students to display knowledge and skills, eliciting understandings, providing feedback and critique, and re-teaching when necessary.
- Teachers in higher-achieving classrooms emphasize basic skills and processes and prefer highly structured classrooms where learning proceeds at a quick pace.
- Teachers in higher-achieving classrooms use classroom management that is firm and decisive, while also nurturing and positive.

Findings on the impact of reduced class size in the SAGE Program are consistent with the Tennessee STAR study results and suggest that reduced class size in early grades significantly increases student achievement. SAGE, like STAR, created impetus for a statewide class-size reduction initiative. In August 2001, the Wisconsin governor signed a budget that provides $171 million for the 2001-2002 and 2002-2003 school years to fully fund a maximum class size of 15 students in grades K-3 in all SAGE schools (Wisconsin Department of Public Instruction, Student Achievement Guarantee in Education Program). For more on SAGE, see *www.uwm.edu/Dept/CERAI/sage.html*.

California's Class-Size Reduction Program

Program Planning and Implementation

Another major state-level initiative influenced by STAR was California's class-size reduction program, which also began during the 1996-1997 school year. That year, state legislators were faced with a large budget surplus, the majority of which had to be spent on education. This coincided with concern about poor student performance, large classes, and interest in the CSR results from STAR (Reichardt, 2000). Legislators designed California's initiative with the goal of increasing student achievement in the primary grades, particularly in language arts and math, by reducing class size in grades K-3 from a statewide average of almost 30 students to a maximum of 20.

California implemented the program very rapidly. In 1996, California districts hired 18,000 new teachers, and by 1999 the number had risen to 29,000 (Stecher & Bohrnstedt, 2000). By the 1998-1999 school year, over 92% of the state's kindergarten through third-grade students were in classrooms with 20 or fewer students, and all but nine school districts were participating (Stecher, Bohrnstedt, Kirst, McRobbie, & Williams, 2001). By the 2000-2001 school year, class-size reduction had been "essentially fully implemented" (Stecher & Bohrnstedt, 2002).

California's CSR initiative is a voluntary incentive program. The state provides districts approximately $850 per student enrolled in the smaller classes and an option of $400 for students in staggered sessions. Federal CSR program funds have been used by districts for hiring and training teachers, and state grants have also been made for new classrooms. This is the largest and most expensive state educa-

tional reform effort in history, involving over 1.8 million students and costing approximately $1.5 billion annually (Reichardt, 2000).

Results

California assesses elementary student achievement using the Stanford Achievement Test (ninth edition) that tests reading, mathematics, language, and spelling. The most recent evaluation (Stecher & Bohrnstedt, 2000)–from the 1998-1999 school year–reported that the percentage of fully certified teachers in grades K-3 dropped from 98% in 1995 to 85% in 2000-2001. A decline in percentages of certificated teachers was noted in middle school as well. Also, schools serving low-income, minority, and English language learner students have fewer well-qualified teachers than other schools.

- While average achievement scores of all elementary grades have increased each year since the state testing program began in 1997-1998, the statewide pattern of exposure to CSR does not match the pattern of achievement score increase, so "no strong relationship can be inferred between achievement and CSR."
- There was "no strong association" between the number of years spent in CSR classrooms and changes in student achievement.
- CSR teachers changed their instruction to spend more time working with small groups and individuals and giving more assistance to poor readers. They also felt they were better able to identify and meet students' needs and to provide timely feedback and individual attention. CSR teachers reported few changes in the curriculum they taught.
- Almost two-thirds of all districts have had to reallocate funds and facilities away from other programs to compensate for insufficient state CSR reimbursement. Programs most often affected have been facility maintenance, administrative services, music/arts, and professional development. Other programs impacted include computer labs, sports, libraries, family centers, after-school childcare, and special education.

California's class-size reduction program has shown initial signs of success in terms of the support of teachers for the initiative and increases in parent-teacher interaction. However, California has not experienced a narrowing of the white-minority achievement gap in reduced-class-size classrooms, and CSR has also raised concerns regarding facility availability, a decline in teacher quality, exacerbation of existing inequities in qualified teacher distribution, and the fact that there was no initial phase-in.[5] Since the program is being implemented along with a number of other statewide reforms–including changes in curriculum standards, state assessments, teacher certification, and student promotion–it is difficult to attribute student achievement gains to any one effort (Stecher & Bohrnstedt, 2002). One of the primary researchers of California's CSR program has stated that, although test scores of California elementary students rose for the third consecutive year in 2000-2001, "I doubt we will ever be able to attribute these changes in test scores to individual

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[5] Although inspired by STAR, California's class-size reduction program differs in a number of significant ways. STAR was a controlled educational experiment involving 11,000 students, while California's program is a statewide reform affecting 1.8 million students. California's maximum class size is 20 students, compared to STAR's smaller maximum range of 13-17 students. Finally, California is more ethnically and linguistically diverse than Tennessee, and has faced challenges regarding classroom space and teacher availability that Tennessee did not (Stecher & Bohrnstedt, 2002).

school reform activities because so many were put into place at the same time" (Rubin, 2001). For more on California's class-size reduction initiative, see *www.classize.org*.

An Example of a Secondary Class-Size Reduction Program in California

The Morgan-Hart Class-Size Reduction Act of 1989 created class-size reduction incentives for grades 10–12. In 1998, California expanded the program to include ninth grade. The program provides funding to districts for schools that reduce class size in ninth-grade English and at least one other course required for graduation—either social studies, math, or science. The majority of the students in the classes must be ninth-graders. The average class size of the smaller classes must be 20 students, with a maximum of 22 students in any reduced class size classroom. Districts receive an additional $170 per student in the smaller classes (California Department of Education). For more information, see *www.cde.ca.gov/hart*.

U.S. Department of Education's Class-Size Reduction Program

From 1998 to 2001, the U.S. Department of Education funded a national Class-Size Reduction Program. The goal of the program was to reduce class size to a national average of 18 in grades 1–3 by helping school districts recruit, hire, and train 100,000 new teachers. Districts also used the funds to provide professional development opportunities for teachers, to allow new teachers to take state competency exams, and to create public report cards to inform parents and communities about progress in reducing class size. The program was targeted at high-poverty districts and districts with high overall student enrollment. It was one of two programs eliminated in the No Child Left Behind Act of 2001. Under the new act, funding from Title II, Teacher and Principal Quality, may be used for CSR.

Chapter three

Recent Class-Size Reduction Initiatives in the SERVE Region

States in the SERVE region have implemented class-size reduction initiatives as well. Alabama, Florida, Georgia, and South Carolina have enacted class-size reduction legislation. In addition, Mississippi educators have used federal funds to reduce class sizes, and smaller classes are a central part of North Carolina Governor Mike Easley's education plan. An overview of these class-size reduction efforts follows.

Alabama

A 1997 Alabama State Board of Education Resolution set class-size caps for grades K-3 at 18 students, grades 4-6 at 26 students, and grades 7-8 at 29 students. This was a change from the previously accepted Southern Association of Colleges and Schools maximums of 25 for kindergarten, 28 for grades 1-3, and 32 for grades 4-8. Districts have used federal class-size reduction funds and state funds to hire additional teachers. The state department of education monitors assignment of additional teachers within districts to ensure they are used in the neediest schools (Alabama State Board of Education, 1998).

Florida

Florida's 1998 Maximum Class Size Study Act (HB 367) funded at least one school in each district to reduce class size to 20 in grades K-3, with critically low-performing schools to receive funding priority; 62 schools implemented the changes. (For more information, see a discussion of the 1998 Florida Maximum Class Size Study Act on page 15.) In 1999, the Florida legislature appropriated $100 million for the construction of additional classroom facilities to support district CSR projects and for grades K-3 (Florida Department of Education, 1999).

Georgia

House Bill 1187, passed in March 2000, provided funding for class-size reduction and required that the regular class sizes for kindergarten be lowered to 15 students and 17 students for grades 1-3. The smaller class sizes are to be phased in over four years (Georgia Department of Education, 2001).

Mississippi

Mississippi used federal CSR funding each of the three years of the program to reduce class size. The U.S. Department of Education granted Mississippi a waiver to allow it to use the funds in kindergarten, as well as in grades 1-3.

Highlighting Class-Size Reduction: South Tippah School District, Mississippi

South Tippah School District, located in northeastern Mississippi, is in its third year of a class-size reduction initiative. For the 1999-2000 school year, South Tippah used its grant of $70,527 to employ two additional first-grade teachers at Ripley Elementary School. This enabled the school to reduce the average class size in first grade from 25 to 19 students. This affected eight first-grade teachers and 153 first-grade students (Rucker & Tankson, 2000). The school experienced an improvement in its first-grade failure rate, which fell from 14.8% in 1998-1999 to 8.9% in 1999-2000.

During the second year of class-size reduction (2000-2001), the district maintained the two additional teachers at Ripley, and the school maintained its lowered failure rate (9%). For the 2001-2002 school year, Ripley is constructing new classrooms to accommodate class-size reduction and will convert up to all four of its Title I teachers to regular classroom teachers in 2002-2003 (personal communication with Dr. Jane Taylor, Federal Programs/Curriculum & Instruction Director, South Tippah School District. August 13, 2001).

North Carolina

North Carolina passed legislation in 2001 that included funding for class-size reduction. Funding was earmarked for teacher salaries to reduce K-3 class size in 36 high-priority elementary schools to 15 students. Funding was also appropriated to reduce class size in the state's continually low-performing schools to 17 students in grades 4-8 and 20 students in grades 9-12 (North Carolina General Assembly).

While many of the class-size reduction efforts in the SERVE region began in the late 1990s or even more recently—motivated in part by Wisconsin and California's results and the federal program—two class-size reduction initiatives at the school and district level in North Carolina started earlier. Burke County Schools, a mid-size school system located in western North Carolina, began phasing in a class-size reduction initiative in the fall of 1991. By 2000, all 17 elementary schools had reduced their class sizes below 20 in first, second, and third grades (see Burke County, North Carolina—A District-Level Class-Size Initiative, Chapter Four). Additionally, Draper Elementary School in Rockingham County began implementing class-size reduction in 1996. The school has lowered class sizes in grades 1-5 to 15 students (see Class-Size Reduction at Draper Elementary School, Rockingham County Schools, North Carolina, Chapter Four). SERVE staff members have had the opportunity to work with these sites since the mid-1990s.

South Carolina

South Carolina's Education Accountability Act of 1998 allocated funds to reduce class size in grades 1-3 to 15 students, with funding priority going to low-performing schools. For fiscal year 2000, a total $36.8 million of state funds was available for class-size reduction (South Carolina State Department of Education, 2000). Districts choose to reduce class size on a school-by-school or class-by-class basis. Districts receiving funding for class-size reduction are required to evaluate the initiative's impact on student achievement.

The state's accountability system does not begin testing students until the third grade. The first cohort of Berkeley students to experience the smaller first-grade classes entered third grade in the 2001-2002 school year, so the district has limited academic achievement data for evaluating the success of its program. Results from two other tests, however, suggested that Berkeley's smaller classes were benefiting the students academically. The Metropolitan Achievement Test (7th edition) was administered

to second-grade students at the end of the 2000–2001 school year. These students were primarily the first cohort of first-grade reduced-class-size students. Their scores showed a ten-percentage-point increase in reading, an eight-percentage-point increase in math, a seven percentage-point-increase in language, and an 11-percentage-point increase in total battery compared with similar data from previous second-graders (Etheridge, 2001a).

Also in May 2001, 13 of Berkeley's 16 elementary schools took advantage of the option to test their first-graders using the TerraNova test. The results showed that 64.7% of the students scored above the national average in reading; 71.2% exceeded the national average in language; 60.6% of the first-graders scored above the national average in math; and 66.1% scored above the national average in total score (Etheridge, 2001b).

Highlighting Class-Size Reduction: Berkeley County, South Carolina

Berkeley County entered its third year of CSR in the 2001–2002 school year. Each of the district's 16 elementary schools has reduced class size in all first-grade classrooms to around 14 students per class. For the 2001–2002 school year, the CSR effort required an additional 52 first-grade teachers above what the district would normally employ with its regular class size of 21 students. Funding for the additional salaries came from a mix of state and federal class-size reduction funds. State funds paid for 32 teachers and federal funds for 20. The district monitors class size four times each year to ensure it does not exceed the maximum number of students (personal communication with Sheldon Etheridge, Director of Federal Programs, Berkeley County Schools, August 17, 2001.)

Chapter four

SERVE's Class-Size Reduction Research—State, District, and School

SERVE staff has studied class-size reduction at the state, district, and school level. SERVE staff members' work in class-size reduction began with an evaluation of Burke County (North Carolina) School District's CSR program in 1994. SERVE staff members have also been evaluating a single school site's CSR initiative since its start in 1996 and conducted a CSR evaluation for the Florida Department of Education. The following is an overview of SERVE's class-size reduction research.

A Study of the 1998 Florida Maximum Class Size Study Act

Program Planning and Implementation

In accordance with the legislation, at least one school in each Florida district reduced its class size to 20 in grades K-3; in all, 62 schools implemented CSR. The legislation called for a study of the efficacy of the act, involving all participating schools and containing verifiable data on the benefits of class-size reduction in terms of student achievement and performance. In 1999, the Florida Department of Education asked SERVE staff to evaluate the statewide initiative (Harman, 2000).

Results

SERVE staff developed a survey and mailed it to the principals of all 62 CSR schools in November of 1999. Fifty-one surveys were returned for an 82% response rate.

Study findings (Harman, 2000) showed that:

- CSR schools reported an average class size of 20.6 compared to 23.6 statewide. Thus, the intent of the legislation was met.
- The CSR schools were demographically similar to other elementary schools in the state, with the exception of the percentage of students eligible for free lunch (69% in CSR schools compared to 52% for elementary schools statewide).
- State achievement tests and educator feedback played the largest roles in selecting the school to receive CSR funds; 48% of the schools receiving CSR funding were rated "D" or "F" in the state's accountability system, compared to 34% of all elementary schools.

- Sixty-five percent of the CSR schools were also engaged in additional school reform efforts, including locally developed and commercially available programs.
- Fifty-eight percent of the CSR schools received additional district resources to help implement class-size reduction, above and beyond the normal resource allocation. These resources included additional staff development, supplemental teacher salaries, additional instructional materials, and new program adoption.
- Approximately one-third of the CSR schools reported receiving staff development for teachers specifically related to class-size reduction (including training in phonemic awareness, manipulatives, curriculum integration, and individualized and small-group instruction).
- High levels of satisfaction were reported for teachers and respondents. All respondents indicated they were "very satisfied" (68%) or "satisfied" (32%) with the CSR effort. Their reporting of teacher satisfaction was similar with 83% considering that most teachers were "very satisfied," 17% "satisfied," and only one respondent (or 2%) reporting that teachers had "significant concerns." *
- The greatest perceived impacts were in the areas of student achievement, student time on task, and teacher morale.
- An examination of results from the six different types of achievement tests administered by CSR respondents revealed that 71% of the grades (1-3) showed an increase in reading scores from the 1997-1998 school year to 1998-1999 school year, while 63% of the grades showed an increase in math scores.

*Note: Due to rounding, numbers do not total 100%.

Burke County, North Carolina—A District-Level Class-Size Initiative

Burke County Schools and Community

Burke County is a largely rural school district located in western North Carolina. According to *Burke County's Annual Report of Progress 1999-2000* (2000), the system serves 14,150 students; employs almost 1,000 classroom teachers; and operates 17 elementary schools, four middle schools, two high schools, and four special-needs schools. The dropout rate is 3.5% in grades 7-10.

According to Superintendent David Burleson, fewer than 60% of the adults in the county have a high school diploma, and 10% have a college degree. The majority of the jobs in the county are in manufacturing—mostly in mills and the furniture industry. State government is another major employer, with two prisons, two mental institutions, and other state facilities. Burke County is considered a poor county by the state and is eligible for special low-wealth funding.

Since it began its CSR initiative in 1991-1992, Burke County's student population has grown increasingly diverse (see Figures 2 and 3 below). Additionally, the limited English proficient segment of the student body has increased from 2% in 1993-1994 to 9% in 1999-2000. The percentage of Burke County students eligible for free/reduced price lunch has also increased from 30% in 1993-1994 to 38% in 1999-2000.

Figure 2
Ethnicity of Burke County Student Population 1991-1992

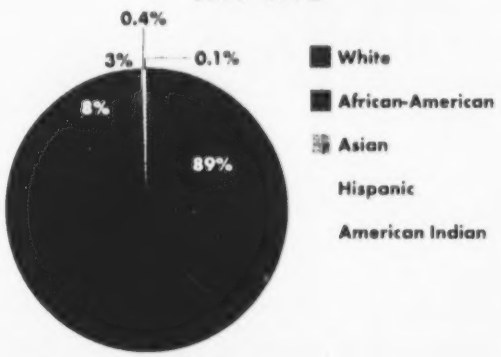
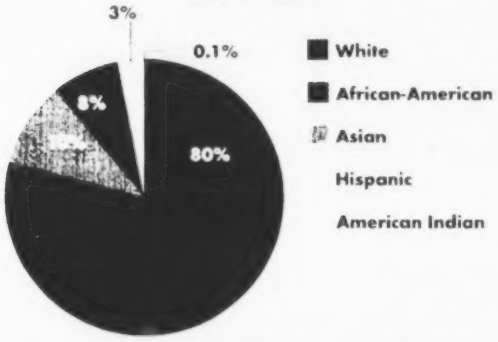


Figure 3
Ethnicity of Burke County Student Population 1999–2000



Program Planning and Implementation

In 1990, the superintendent decided to look into a reduced-class-size program at the elementary level to increase student math and reading achievement. A feasibility committee was formed to evaluate the practicality of such an initiative and conducted an examination of the research on class size and student achievement, an evaluation of elementary school facilities as related to classroom space, a study of personnel requirements, and a study of staff development needs. Based on its findings, the committee recommended that a pilot be established in first grade. The committee also developed an application process for schools desiring to participate in the program. Four elementary schools were chosen to participate in the pilot.

First-year evaluation results (1991 - 1992) of the reduced-class-size initiative of first-grade classes in the four schools were positive, and the district began a careful expansion of the program. Each year, the district piloted small classes (approximately 15 students) at the next higher grade, evaluated the results, and implemented small classes across all or most district schools at the previously piloted grade. Today, all first-, second-, and third-grade classrooms in Burke County's 17 elementary schools have small classes.

Facets of the Burke County Reduced-Class-Size Initiative

The Burke County reduced-class-size project is a multi-faceted school improvement initiative with financial, facility, personnel, and staff development issues to consider. Actions taken in those areas are summarized as follows:

- Funding: Burke County has made small class size a budget priority and found creative ways to fund it. Funding originally came from contingency funds from the system's operating budget. The annual budget for class-size reduction for 2001–2002 was just over $3 million. Of that, $1.7 million came from converting the teacher assistant funds, $340,000 from the federal CSR program, and the bulk of the remainder from state-provided, low-wealth district funds (personal communication with Burke County Superintendent David Burleson on August 17, 2001, and Burke County Grants Development Specialist Wendy Jodry on October 15, 2001).

- Space: Prior to the beginning of the 1991 pilot, the school system went from a configuration of K - 6 elementary, 7 - 9 junior high school, and 10 - 12 high school to a configuration of K - 5, 6 - 8, and 9 - 12. This change made previous sixth-grade classrooms in elementary schools available for primary classroom space. Mobile units were added in elementary schools where space was limited. Because parents have always strongly supported the reduced-class-size program, using mobile units for additional classroom space has not been an issue. In some cases, the district also remodeled and reopened older schools that had previously been closed. Several new elementary schools have been built as well.

*Note: Due to rounding, numbers do not total 100%.

◇ Personnel: With the reduced-class-size initiative, Burke County officials decided not to use teacher assistants in the smaller classes.[1] Displaced assistants were trained to work in a one-on-one tutoring program or were moved to work in the upper grades of their assigned schools. Some assistants who quit or retired were not replaced. No one lost his or her job as a result of the new initiative. At the time, the elimination of teacher assistants in grades 1–3 was controversial because community support for the assistants was strong.

Like most school districts, Burke County continually strives to attract and keep quality teachers. During the 1999–2000 school year, the district hired 197 teachers, 122 of whom were new. The district feels the small classes in grades 1–3 give it an advantage in teacher recruitment and retention. Other incentives include:

- ◇ A signing bonus of $1,250
- ◇ Free Internet access through the school system
- ◇ Partnerships with regional colleges that bring graduate courses into the area
- ◇ A first-year mentor for each new teacher
- ◇ Networking events for all first-year teachers (Burke County Public Schools, 2000)

Most of the class-size reduction budget is for teacher salaries and related expenses, including fixed charges, instructional materials, and other related costs. These are recurring expenses to the school district (Egelson & Harman, 2000).

◇ Staff development: A comprehensive staff development program for participating teachers has been part of the reduced-class-size initiative since its inception. Staff development has focused on altering teaching methods—not only changing what is taught but also how it is taught—to take full advantage of the smaller classes. Since the mid-1990s, funding from North Carolina School Improvement grants and Title VI allocations has supported district staff development efforts.

The district emphasizes teachers giving "attention to identifying and responding to individual student needs, teaching with positive classroom management, and building on student strengths" (Burke County Public Schools, 2000). Today, staff development for all elementary teachers in Burke County includes literacy development, math and science teaching strategies, problem solving, integration of the curriculum, and teaching to individual learning styles. Staff development begins immediately with all new and beginning teachers and includes:

- ◆ Week-long new teacher orientation on Burke County Performance Indicators and reading strategies and assessments
- ◆ Bimonthly workshops on topics such as guided reading, graphic organizers, writing strategies, portfolio assessment, strategic questioning, phonemic awareness, literature circles, and instructional groupings
- ◆ Additional sessions for beginning teachers on math manipulatives and problem-solving strategies
- ◆ Readings in the content areas of health, science, and social studies

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[1] Since the 1980s, the state of North Carolina has funded teacher assistants in all primary (K–3) classrooms, and districts were prohibited from using money for assistant positions for teacher positions. In 1995, the state legislature passed a law that allowed Burke County to convert the teacher assistant dollars into teacher position funds.

Results

Results of the class-size reduction program are divided into three categories: perceived benefits, classroom observations, and academic achievement results.

- Perceived benefits: In the early years of the program (1991 - 1995), Burke County teachers, administrators, and parents completed surveys, provided interview responses, and testified at board meetings about class-size reduction. In all cases, the results strongly favored the reduced-class-size initiative. Responses to the surveys, interviews, and testimonies fell into five interrelated and complementary categories.
  - Expanded classroom space
  - Improved classroom management
  - Enhanced instruction and assessment
  - Enhanced student self-concept and relationships with peers
  - Stronger teacher-parent communication

  According to Burke County Superintendent David Burleson, while there were some initial concerns—mainly the loss of the assistants and changes in specialty programs—annual surveys conducted by the superintendent since the late 1990s consistently found that a majority of the parents want smaller classes as the top funding priority.

- Classroom Observations: During the 1993 - 1994 school year, when the pilot students were in third grade, Burke County officials sought outside evaluation assistance for the initiative, and SERVE staff began working with Burke County personnel. As part of the evaluation, SERVE staff members conducted three separate rounds of classroom observations in Burke County schools.

  - In April 1995, two trained observers observed reduced (fewer than 18 students) and regular-sized (24 or more students) third-grade classrooms in four Burke County elementary schools. (This was before all third-grade classrooms in the system had moved to small class size.) The observers used the Personal-Instructional-Task instrument (French & Galloway, 1970). The focus was on teacher-student communication events as they related to instructional time and frequency of discipline incidents. Results showed that in reduced-class-size classrooms, 86% of classroom time was spent on instruction and 14% on institutional events, as opposed to 80% instructional time and 20% institutional events in regular-sized classrooms.

  - In October 1999, four SERVE observers viewed first-, second-, and third-grade classrooms in five Burke County elementary schools. Observers chose the schools based on End-of-Grade test results in math and reading. The five schools fell at all points on the test-score continuum, from the highest in the county to the lowest. The observation instrument used was the School Observation Measure (Smith, Ross, Alberg, & Lowther, 1999). Eight to ten classrooms were visited in each school.

    The purpose of the observations was to describe the typical instructional strategies employed in the district in the reduced-class-size classrooms. Arriving unannounced, an observer spent 15 minutes in each classroom recording what was taking place in terms of grouping, instructional and orientation practices, student activity, technology use, and assessment techniques. The following is a synopsis of the observations:

    - Student time on task and academic focus were consistently high in first-, second-, and third-grade classrooms.

- Direct instruction was the most common instructional strategy observed.
- Teacher-student interactions in the form of "teacher as coach" and "instructional feedback" were also frequently observed.
- Achievement benefits of smaller classes (see below) seemed to accrue because of increased instructional time of both teacher and student, the monitoring of individual student progress, and the correction of individual work (Harman & Egelson, 1999).

- In February 2001, two SERVE staff members returned to Burke County. They chose two elementary schools not visited before for classroom observations and observed a total of 13 classrooms. Observations lasted 15 minutes each and were recorded using a SERVE-developed instrument. The focus of the instrument was on student grouping, teacher activities, and student-teacher interaction. The following is a synopsis of their observations:
  - Whole-group instruction and individual instruction were predominant in the classrooms.
  - Direct instruction was common.
  - Academic focus (time on task) was high.
  - Interactions between teachers and students were instructionally focused.

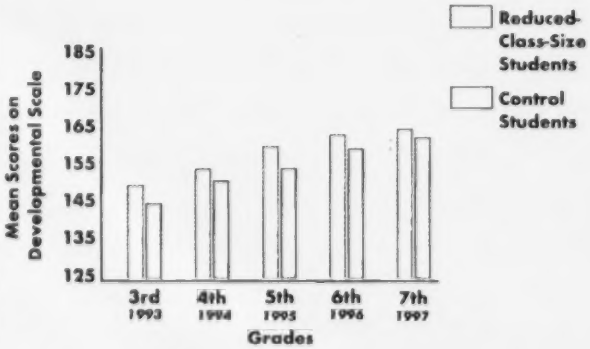
- Academic Achievement Results: Student achievement results related to class-size reduction are presented in three ways:

1) Comparison of End-of-Grade test scores in math and reading tests for grades 3-7 of matched students in small and regular-size classrooms, 1993-1994 to 1997-1998:

During the 1991-1992 pilot-study year, Burke County educators established a matched-pairs design to assess the impact of small class size (1:15) on student achievement. Since at that point only four of the 14 elementary schools had reduced first-grade classes to 1:15, the other ten schools were available as control schools with class sizes of approximately 25 students (1:25). Matched pairs were subsequently created, separately for reading and math, on the following criteria:

- First-grade reading pre-test (based on the book series)
- State-developed math pre-test
- Race
- Sex
- Socio-economic status as measured by free-lunch eligibility
- Teacher experience

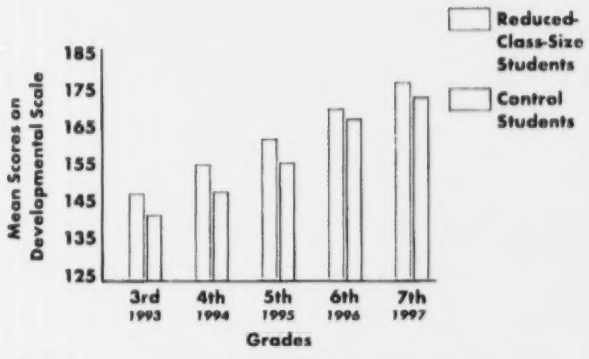
Figure 4
Comparison of Burke County Students' Reading Achievement



Figures 4 and 5 summarize mean developmental scale score[2] comparisons for the End-of-Grade math and reading tests in grades 3–7. Longitudinal analyses of the first cohort of small-class-size students showed that the academic benefits gained in first grade were maintained through the end of seventh grade for the original matched pairs in both reading and math. In each grade, results consistently demonstrated that small-class-size students in the original matched pairs outperformed their counterparts in larger classes in reading and math.[3]

Note: The number of matched pairs for grades 3–5 grade ranged from 34 to 40 and for grades 6–7, from 26 to 33.

Figure 5
Comparison of Burke County Students' Math Achievement



2) Comparison of ninth-grade end-of-course English I scale score means for students from a matched school pair, 1999–2000:

In February 2001, Burke County's testing director conducted an internal evaluation of the sustained effects of smaller classes using the original cohort (personal communication with Margaret Church, March 2001). She compared the ninth-grade end-of-course English I scale score means for students from a matched school pair. Students from one school had experienced smaller classes for three consecutive years (first, second, and third grades), while the students from the other school had experienced regular class sizes. The two schools were matched on demographic variables and were in close proximity to each other. Both sets of students attended the same middle school and high school.

Table 1 provides the results of this comparison. Students in the reduced-class-size cohort had a higher scale score mean than students who had experienced only regular-size classes.[4] This difference was approximately eight percentile ranks.

Table 1
1999–2000 Ninth-Grade English I Scale Score Means and Percentiles for Students from a Matched School Pair in Burke County

Treatment	Sample Size	English I Scale Score Mean	Percentile
Reduced-Class-Size Cohort	49	57.0	66
Regular-Class-Size Cohort	18	55.3	58

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[2] The developmental scale score was designed to measure student growth. Thus, scale scores are expected to increase from grade level to grade level.

[3] Number of reading and math matched pairs at each grade level: (50, 50) third grade, (40, 34) fourth grade, (40, 34) fifth grade, (32, 26) sixth grade, (33, 26) seventh grade. For more specific details on these results, please consult Achilles, Harman, & Egelson, 1995; Egelson, Harman, & Achilles, 1996; Harman, Egelson, & Achilles, 1997; Egelson & Harman, 2000.

[4] This difference was not statistically significant.

3) Gains in third-, fourth-, and fifth-grade reading and math proficiency scores 1993-1994 to 2000-2001:

The implementation of Burke County's class-size reduction initiative coincided roughly with the creation of North Carolina's state accountability program, the ABCs (first implemented in 1993). The ABCs have been credited with statewide gains in student achievement, and it is useful to compare the gains Burke County made with state gains during the same period.

Third-, fourth-, and fifth-grade reading and math proficiency percentages for both North Carolina and Burke County had relatively large increases from 1993-1994 to 2000-2001 (see Table 2). In all but two categories—third-grade and fifth-grade reading proficiency—Burke County gains exceeded those of the state as a whole. The differences were greatest in math, with Burke County gains 11.7%, 7.3%, and 7.9% greater in third-, fourth-, and fifth-grade math proficiency, respectively, than the state's gains.

Conclusion

Burke County is convinced of the value of reducing class sizes from examining the increases in its student achievement over the past decade. There were barriers to overcome, which included costs of implementing the program, lack of classroom space, availability of qualified teachers, and the loss of teaching assistants in primary grades. Added to these were a rapid increase in English language learners, the tenures of three superintendents, and several school board turnovers since the start of the program. Progress was not easy, but commitment to class-size reduction remains strong from the Burke County Board of Education, the superintendent, teachers and administrators, community members, and parents. For more information on Burke County Schools, see *www.burke.k12.nc.us*.

Table 2
Summary of Burke County Achievement Results, 1993–1994 to 2000–2001

	Proficiency Percentages				Gains in Proficiency Percentages 1993–1994 through 2000–2001	
	1993–1994		2000–2001			
	Burke County	North Carolina	Burke County	North Carolina	Burke County	North Carolina
Third-Grade Reading	65.6%	60.4%	81.3%	76.4%	+15.7%	+16.0%
Third-Grade Math	65.4%	61.6%	89.1%	73.6%	+23.7%	+12.0%
Fourth-Grade Reading	68.9%	65.8%	80.5%	74.6%	+11.6%	+8.8%
Fourth-Grade Math	72.4%	67.0%	97.1%	86.8%	+24.7%	+17.4%
Fifth-Grade Reading	69.9%	65.5%	84.9%	82.7%	+15.0%	+17.2%
Fifth-Grade Math	67.4%	63.9%	98.1%	86.7%	+30.7%	+22.8%

Class-Size Reduction at Draper Elementary School, Rockingham County Schools, North Carolina

Draper Elementary School and Community

Draper Elementary is a small PreK-5 school located in a rural working class community in Rockingham County, in north central North Carolina. During the 2001-2002 school year, Draper served 312 students, 72% of whom were eligible for free or reduced price lunch. Its student body was 64% white, 27% black, 4% Hispanic, and 5% multiracial (Rockingham County Public Schools, 2001). Draper is a small mill community, and a majority of the parents who send their children to Draper are working class or working poor. The campus is comprised of three well-maintained buildings. The original building was constructed in the 1920s and houses the gym and grades 3-5. A newer building constructed in the 1960s includes the office, cafeteria, and grades pre-K-2. The newest building on campus is the media center.

Program Planning and Implementation

In 1995, the superintendent, principal, and faculty began considering implementing small classes at Draper as a means to improve student achievement results. The superintendent believed reducing class size would result in improved student achievement, and there was classroom space available because school enrollment had declined. SERVE staff suggested that the principal and teachers visit Burke County to observe class-size reduction in action and to speak to teachers there. Following their visit, the Draper educators decided they were willing to utilize smaller classes as a way to improve student learning. In the fall of 1996, class size in all first- through fourth-grade classrooms in the school was lowered to approximately 15 students. Kindergarten class size was not reduced because teachers wanted to keep their assistants. (During the third year of the class-size-reduction initiative, one kindergarten teacher chose to change to the small class format.) In the fall of 1997, Draper reduced class size in all fifth-grade classrooms as well (Harman & Egelson, 2000a).

Draper has since implemented complementary elements, including:

- ◇ The SRA reading program for K-5, which groups children by ability rather than grade level, has a strong phonics component and includes high-interest reading passages across content areas
- ◇ An intensive, voluntary after-school tutoring program using selected faculty to work with students performing below grade levels in grades 3, 4, and 5
- ◇ A one-to-one, in-school mathematics instructional program for struggling students
- ◇ Ongoing writing portfolios for students that include certain types of selections at each grade level
- ◇ Formation of a parent group that volunteers at the school
- ◇ More parent-child events held throughout the year

Facets of Draper Elementary School's Reduced-Class-Size Initiative

Draper's principal used considerable ingenuity, especially in personnel assignment, and was able to reduce class sizes without additional expenditures. To create the five additional teacher positions necessary for the initial class-size reduction, the principal converted the five teaching assistant positions for grades 1-4, one-and-a-half Title I positions, one Spanish teacher position, and portions of the physical education and music positions into regular classroom teacher positions. The removed assistants were assigned elsewhere in the district. To ensure that the students still had physical education and music class weekly, some classes were doubled up for those sessions.

The school also benefited financially from having the additional classroom space necessary for class-size reduction available due to declining enrollment. This availability eliminated the need for potentially expensive mobile unit purchases or facility expansions.

Draper's staff development places emphasis on curriculum integration and on identifying different learning styles in teaching reading and writing. A focus on technology is also woven into all staff development activities. The district and external contractors provide staff development to the school.

Results

SERVE staff has worked with Draper Elementary from the start of its class-size reduction initiative and began evaluating the program in 1996. The initial evaluation plan was designed to assess (a) the initiative's implementation, (b) the perceived impact of the program, and (c) the program's impact on student achievement. Initial implementation issues and perceived impact of the program were evaluated using focus groups and interviews with teachers and parents. Student achievement was evaluated using the Multilevel Academic Survey Test (MAST) for primary students and the North Carolina End-of-Grade reading and math tests for grades 3-5. Recently, SERVE staff began examining other potential impacts of smaller class sizes through classroom observations. The following sections outline the types of data collected and the results.

- Initial Implementation Issues and Perceived Benefits

  The teacher and parent focus groups conducted at the end of the 1996-1997 school year highlighted several implementation difficulties, as well as many perceived benefits of smaller classes (Harman & Egelson, 1997).

  - Implementation Issues

    - Teachers felt it was a difficult adjustment to lose their assistants and were also concerned about lack of planning time, the loss of the reading lab and learning disabilities teachers, and the burdens placed on the specialty area teachers to accommodate the smaller classes.

    - Parents were concerned about the loss of the assistants, the loss of the Spanish program, the loss of quality in the specialty programs (physical education, art, music), and the impact on students when they transition to a larger middle school in sixth grade.

  - Perceived Benefits

    - On the positive side, teachers noted that they were able to do more grouping, move through the curriculum at a faster pace, and provide more individual attention. They remarked that students participated and cooperated more in smaller classes. They also noted an increased level of communication with parents.

    - Parents confirmed the increased communication between teacher and home, citing student progress reports, parent functions, and reading nights as evidence. They commented on the family atmosphere at the school and the greater variety of instruction taking place in classes. Parents also felt their children received more individual attention, liked school better, and were more confident.

      In the spring of 2001, SERVE staff members surveyed the teaching staff at Draper about their class-size reduction experiences, especially contrasts between pre- and post-class-size reduction teaching. Twenty-one teachers responded. The following is a synopsis of responses:

- Teachers reported changing their instructional practices from largely whole-group instruction—with some small-group and individual instruction—to a more varied approach, including a much increased emphasis on individual and small-group instruction, hands-on activities, and project-based learning. They attributed the changes mainly to fewer students and to the subsequent increase in time to get to know their students and evaluate and respond to their needs.

- Teachers reported changing assessment practices from primarily relying on testing to an increased use of portfolio assessments and classroom projects. They felt the lower numbers of students allowed more time for one-on-one assessment. Approximately one-third, though, reported little or no change in their assessment practices.

- When questioned about changes to Draper since the start of class-size reduction, teachers noted an increase in student achievement, the implementation of the SRA reading program, an increase in grade-level planning, better teacher-student and teacher-parent relationships, the growth of the school's ESL population, and an improved school climate.

Classroom Observations

In the spring of 2000, SERVE staff began observing classrooms to determine what occurs in reduced-class-size classrooms in terms of teacher-student interactions, student-student interactions, instructional strategies employed, and classroom management. In the fall of 2000, SERVE staff returned and observed the types and purposes of interactions occurring between students and teachers and between students and students.

During the spring observations, 19 classrooms were visited and observations recorded using the School Observation Measure (Smith et al., 1999). The most frequently observed instructional strategies were instructional feedback to enhance student learning (15 classrooms), direct instruction with the entire class (14 classrooms), and independent seatwork (12 classrooms). A high level of academically focused time was observed in 17 of 19 classrooms. A high level of student engagement was observed in ten classrooms, and a moderate level of student engagement was observed in nine classrooms.

For the fall of 2000 visit, observers used a SERVE-developed instrument and visited 12 classrooms. In each of the classrooms, a teacher worked with one student at a time while the rest of the students were busy with class work. In all the rooms, the students were on task, and there were no behavior problems. Conversations among students related to academic matters. There was also plenty of teacher praise in each room.

Academic Achievement

- MAST—The most pressing concern for district and school personnel was examining the impact of smaller classes on student achievement, as Draper's students were not performing as well as educators felt they should be. Based on research, SERVE staff also knew that the largest effects were likely to occur in the primary grades. Consequently, SERVE staff decided to administer a criterion-referenced test in first and second grades to assess the impact of smaller classes.

  SERVE staff selected the MAST because of its focus on early literacy and numeracy skills, phonics, ease of use, and cost. Two different forms of the MAST—the primary and the extended—have at times been

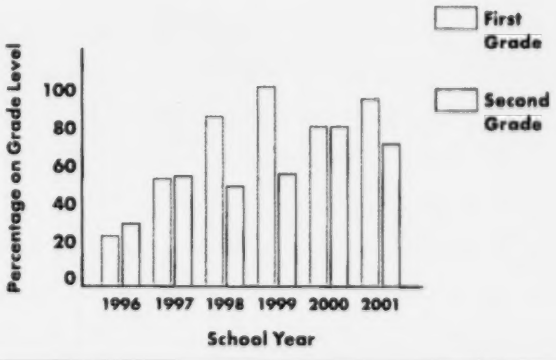
administered over the course of the Draper study. The primary form focuses on phonics, word recognition, addition, and subtraction, while the extended form focuses on reading, decoding, and comprehension. (The extended form has rarely been used, and then for school use only in terms of assessing student readiness for promotion to the next grade.) For the first- and second-grade analyses, comparisons were made of the percentage of students on grade level at pre-test and post-test, as there were no control students tested using the MAST.

In Draper's first year of class-size reduction, 42% and 44%, respectively, of first- and second-graders were on grade level at the end of the school year compared to 21% and 26% at the beginning of the year (see Figure 6). The second project year also saw an increase in the percentage of first-graders on grade level. This result suggests either an impact of the SRA program or that teachers were more effective in their second year of teaching in smaller classes. Since then, the percentage of first-graders on grade level at the end of the year has been fairly stable. Second-grade results were stable for the second and third years of the initiative and have increased for the past two school years.

First-year math results at Draper found 58% and 62% of first- and second-grade students, respectively, on grade level in math at the end of the year compared to 18% and 33% at the beginning of the year (see Figure 7). First-grade results have been stable since the gain of the initial year. Second-grade results showed an additional gain in the second year, suggesting that students benefit from having smaller classes in first grade. Since the second project year, the percentage of second-grade students on grade level in math has been fairly stable.

◇ End-of-Grade—SERVE staff utilized existing North Carolina End-of-Grade tests in reading and math for grades 3, 4, and 5 to compare the progress of Draper students to the district over the life of the initiative. Tables 3 and 4 provide these results.[5] Initial contextual analyses conducted for the first-year evaluation report found that academic growth of Draper students has historically been smaller than growth made by similar students districtwide (Harman & Egelson, 1997; Harman & Egelson, 2000b). These results need to be kept in mind when interpreting End-of-Grade results.

Figure 6
Percentage of First- and Second-Grade Students on Grade Level in Reading at the End of the School Year



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[5] Since grade-level sample sizes at Draper are small (n < 50), in these tables the percent of students proficient was averaged for the two baseline years (1994-1995 and 1995-1996 for third and fourth grade, 1995-1996 and 1996-1997 for fifth grade) and for the two most current school years (1999-2000 and 2000-2001).

Table 3
Comparison of Reading Achievement Scores Between Draper and the District 1994–1995 through 2000–2001

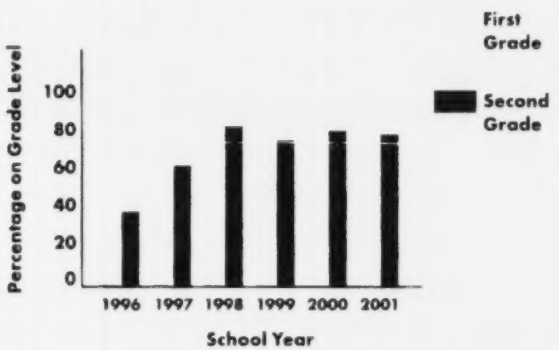
Grade	Comparison	Baseline Percent Proficient	Current Percent Proficient	Percent Gain
3rd Grade	Draper	63.5%	65.5%	2.0%
	District	58.7%	73.7%	15.0%
4th Grade	Draper	64.1%	69.4%	5.3%
	District	63.0%	71.0%	8.0%
5th Grade	Draper	55.0%	75.8%	20.3%
	District	64.1%	79.2%	15.1%

Table 4
Comparison of Math Achievement Scores Between Draper and the District 1994–1995 through 2000–2001

Grade	Comparison	Baseline Percent Proficient	Current Percent Proficient	Percent Gain
3rd Grade	Draper	66.8%	69.9%	3.1%
	District	58.1%	76.1%	18.0%
4th Grade	Draper	63.7%	93.0%	29.3%
	District	65.6%	89.9%	24.3%
5th Grade	Draper	59.3%	90.1%	30.8%
	District	65.5%	89.0%	23.5%

- Since implementing CSR, Draper has had a greater percentage gain in fifth-grade reading and math proficiency.[6] Draper and the district experienced similar growth in fourth-grade reading with the district having slightly greater gains. In fourth-grade math, Draper experienced greater gains in the percentage of students considered proficient than the district overall. In third-grade reading and math, the percentage gain for the district has been much greater than Draper.

Figure 7
Percentage of First- and Second-Grade Students on Grade Level in Math at the End of the School Year



Conclusions

Longitudinal achievement results for Draper first- and second- graders suggest that they benefitted in reading and math by experiencing smaller classes. Over time, third-, fourth-, and fifth-grade results have been inconsistent. Fifth-grade results have been the most positive with greater gains for Draper students than for the district in student proficiency in reading and math. These results suggest that Draper students continue to benefit from smaller classes in fourth and fifth grade and are able to meet state standards by the time they begin middle school. For more information on Draper Elementary School, see *www.rock.k12.nc.us/Drpr.htm*.

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[6] In North Carolina, proficiency is defined as achieving Level III or IV on an End-of-Grade test. Levels I and II are considered below grade level; Level III is at grade level; and Level IV is above grade level.

Chapter five

Conclusions, Recommendations, and Future Work

The 1990s was a time of unprecedented expansion of class-size initiatives on many scales: national, state, district, and school. The following conclusions are based on recent research on class size and evaluations of class-size initiatives. Also included is SERVE staff's future work in this area.

Conclusions

Implementation

- It is class size that makes a difference, not the pupil-teacher ratio. STAR results demonstrated that it is more important to have fewer students in a classroom than a larger number of students with a teacher assistant (Finn & Achilles, 1990). In terms of gaining the support of school staff for CSR, the primary barrier to initial implementation is concern about the loss of teacher assistants (Egelson & Harman, 2000; Harman & Egelson, 1999). Those implementing CSR need to bear in mind that it may be a difficult adjustment for teachers not to have an assistant in their classroom.

- Be creative in funding CSR. By reallocating his FTE, Draper's principal was able to reduce class sizes without additional expenditures (Harman & Egelson, 2000b). Burke County funds approximately 60% of its CSR through FTE monies allocated for teacher assistants. Two districts in Wisconsin have been able to accomplish CSR through similar means (Odden & Archibald, 2001).

- Implement CSR in high-poverty/high-minority schools first. While CSR benefits all students, research from STAR and evaluation of Wisconsin's SAGE project have shown that CSR especially benefits minority and low-income students (Word et al., 1990; Molnar et al., 1999) . Thus, the achievement gap is reduced through CSR (Krueger & Whitmore, 2001).

- When initially implementing large-scale initiatives, start small and scale up. Adequate preparation for implementation can avoid some of the problems California experienced with teacher shortages, inequitable distribution of qualified teachers, and lack of necessary facilities (Stecher & Bohrnstedt, 2000).

Program Design

- Recent research and evaluations have consistently demonstrated that students in small class sizes of approximately 15 realize greater achievement gains than students in typical class sizes (Finn & Achilles, 1990; Molnar et al.,1999; Egelson & Harman, 1999). However, it is still unclear how small is small enough.

- Start children early (kindergarten preferably) in reduced-size classes, and keep them in small classes for at least three years. STAR results found that small classes in kindergarten had the biggest impact, followed by first grade (Achilles, 1999). The more years in reduced-size classrooms, the greater the academic benefit and the longer it is sustained. STAR showed that at least three years were required to produce sustained benefit, and four were even better (Finn, Gerber, Achilles, & Boyd-Zaharias, 2001).

Classroom Instruction and Professional Development

- CSR makes a difference, regardless of the type of instruction. STAR demonstrated that smaller classes, in and of themselves, make an impact on student achievement (McRobbie, Finn, & Harman, 1998).

- Research and evaluations have shown that teachers' behavior does not dramatically change when they teach in smaller classes (Achilles, 1999; Egelson & Harman, 2000; Harman & Egelson, 2000b). Observations of CSR initiatives have shown that teacher-directed instruction remains a prevalent form of instruction (see also Filby, Cahen, McCutheon, & Kyle, 1980; Molnar et. al., 1999).

- Research and evaluations have shown that teachers are better able to monitor and provide corrective feedback to students than teachers with larger class sizes (Molnar, Smith, & Zahorik, 2000; Egelson & Harman, 2000; Harman & Egelson, 2000c).

- While many class-size initiatives (e.g., California and Wisconsin) require professional development as part of class-size reduction, it is unclear if increased (targeted) staff development for CSR teachers makes a difference in student achievement. However, research has also demonstrated that some teaching strategies are more effective than others (Hattie, 1999). Some of these effective strategies (e.g., remediation/feedback and reinforcement) are much easier to implement in smaller classes. Also, experienced teachers may have developed ingrained habits necessary for managing large classes that are not optimal for small classes (Pannozzo & Finn, 2000). Therefore, it would seem to be advantageous to include professional development as a component of a class-size initiative.

Recommendations and SERVE's Future Research

Our recommendations include continuing research on what occurs in CSR classrooms. (What are teacher-student and student-student interactions like? What is instruction like? How do discipline and time-on-task change?) A second recommendation is observing in high-performing and low-performing CSR classrooms. (How do highly effective teachers maximize the achievement benefit of CSR?) Third, conducting studies on creative CSR funding is critical. (How can educators and policymakers keep costs down and fund CSR?) Finally, examining successful implementation strategies is a priority. (What implementation

factors are present in successful sites, particularly in previously low-performing schools?)

SERVE staff's future CSR research closely mirrors what is described above. We will continue to follow our two North Carolina sites, examining student achievement over time and observing in classrooms. Yearly findings will be posted on our SERVE website. In 2002, we will develop two documents. The first will be *A Parents' Guide to Class-Size Reduction* that will be targeted to parents, a population that has largely been ignored but is critical to CSR success. The second will be *How Districts Finance Class-Size Reduction*, a publication that will provide administrators with the information on how to fund CSR. SERVE staff welcomes the opportunity to continue to provide researchers, policymakers, and educators from across the nation with CSR research that will assist them in making informed decisions.

Appendix

Additional Class-Size Reduction Links

National Education Association
www.nea.org/issues/classsize

American Federation of Teachers
www.aft.org/parentpage/class_size/index.html

American Association of School Administrators
www.aasa.org/issues_and_insights/district_organization/class_size_school_size.htm

Education Commission of the States
www.ecs.org/ecsmain.asp?page=/html/issues.asp

National Association of Elementary School Principals
www.naesp.org/hot_size.htm

National Parent Teacher Association
www.pta.org/ptawashington/issues/classsize.asp

Reduce Class Size Now
www.reduceclasssizenow.org

CSR Research Consortium
(California)
www.classize.org

Center for Education Research, Analysis, and Innovation
SAGE Initiative Evaluation
(Wisconsin)
www.uwm.edu/Dept/CERAI/sage.html

Health and Education Research Operative Services, Inc. (HEROS)
www.heros-inc.org

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About SERVE

SERVE, directed by Dr. John R. Sanders, is an education organization with the mission to promote and support the continuous improvement of educational opportunities for all learners in the Southeast. The organization's commitment to continuous improvement is manifest in an applied research-to-practice model that drives all of its work. Building on theory and craft knowledge, SERVE staff members develop tools and processes designed to assist practitioners and policymakers with their work, ultimately, to raise the level of student achievement in the region. Evaluation of the impact of these activities combined with input from affected stakeholders expands SERVE's knowledge base and informs future research.

This vigorous and practical approach to research and development is supported by an experienced staff strategically located throughout the region. This staff is highly skilled in providing needs assessment services, conducting applied research in schools, and developing processes, products, and programs that inform educators and increase student achievement. In the last three years, in addition to its basic research and development work with over 170 southeastern schools, SERVE staff provided technical assistance and training to more than 18,000 teachers and administrators across the region.

SERVE is governed by a board of directors that includes the governors, chief state school officers, educators, legislators, and private sector leaders from Alabama, Florida, Georgia, Mississippi, North Carolina, and South Carolina.

At the core of SERVE's business is the operation of the Regional Educational Laboratory. Funded by the U.S. Department of Education's Office of Educational Research and Improvement, the Regional Educational Laboratory for the Southeast is one of ten programs providing research-based information and services to all 50 states and territories. These Laboratories form a nationwide education knowledge network, building a bank of information and resources shared nationally and disseminated regionally to improve student achievement locally. SERVE's National Leadership Area, Expanded Learning Opportunities, focuses on improving student outcomes through the use of exemplary pre-K and extended-day programs.

In addition to the Lab, SERVE operates the Southeast Eisenhower Regional Consortium for Mathematics and Science Education and the SouthEast Initiatives Regional Technology in Education Consortium (SEIR◆TEC). SERVE also administers a subcontract for the Region IV Comprehensive Center and has additional funding from the Department to provide services in migrant education and to operate the National Center for Homeless Education and the Adjunct ERIC Clearinghouse on Homeless Education.

Together, these various elements of SERVE's portfolio provide resources, services, and products for responding to regional and national needs. Program areas include

- Assessment, Accountability, and Standards
- Children, Families, and Communities
- Education Leadership
- Education Policy
- Improvement of Science and Mathematics Education
- School Development and Reform
- Technology in Learning

In addition to the program areas, the SERVE Evaluation Unit supports the evaluation activities of the major grants and contracts and provides contracted evaluation services to state and local education agencies in the region. The Technology Support Group provides SERVE staff and their constituents with IT support, technical assistance, and software applications. Through its Publications Unit, SERVE publishes a variety of studies, training materials, policy briefs, and program products. Among the many products developed at SERVE, two receiving national recognition include *Achieving Your Vision of Professional Development*, honored by the National Staff Development Council, and *Study Guide for Classroom Assessment: Linking Instruction and Assessment*, honored by Division H of AERA. Through its programmatic, technology, evaluation, and publishing activities, SERVE provides contracted staff development and technical assistance in specialized areas to assist education agencies in achieving their school improvement goals.

SERVE's main office is at the University of North Carolina at Greensboro, with major staff groups located in Tallahassee, Florida, and Atlanta, Georgia, as well as satellite offices in Durham, North Carolina, and Shelby, Mississippi. Unique among the ten Regional Educational Laboratories, SERVE employs a full-time policy analyst to assist the chief state school officer at the state education agencies in each of the states in the SERVE region. These analysts act as SERVE's primary liaisons to the state departments of education, providing research-based policy services to state-level education policymakers and informing SERVE about key state education issues and legislation.

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RESEARCH & DEVELOPMENT

Class-size reduction (CSR) is one strategy researchers have found that increases student achievement and, in many cases, reduces the achievement gap. This publication summarizes findings from several major state-level CSR initiatives, including Tennessee's Project STAR, Wisconsin's SAGE program, and California's CSR initiative. It also provides an overview of the U.S. Department of Education's CSR program and examines CSR implementation and results over time in two North Carolina districts. The publication includes conclusions and recommendations for CSR implementation, project design, classroom instruction, professional development, and research and evaluation. It offers information for a variety of audiences, including policymakers, parents, and state-, district- and school-level educators.

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